Ecological significance of C_4 photosynthesis: A comparison of C_3 and C_4 subspecies of *Alloteropsis semialata* and other NADP-ME Panicoid grasses

B.S. Ripley[a], M.E. Gilbert[a], D.G. Ibrahim[b], C.P. Osborne[b]
[a]*Botany Department, Rhodes University, PO Box 94, Grahamstown 6140, South Africa*
[b]*Department of Animal and Plant Sciences, University of Sheffield, Sheffield S10 2TN, United Kingdom*

The photosynthetic efficiency of C_3 grasses declines with increasing temperature and C_4 grasses are predicted to be advantaged at temperatures above 15 °C. We demonstrated an above-ground productivity difference in a common-garden experiment with *Alloteropsis semialata* and show that it is related more to differences in life-history than to photosynthesis. Frost caused leaf mortality in the C_4 but not C_3 subspecies, which maintained photosynthetic leaf area throughout the winter. As a consequence the C_3 plants were detrimentally affected by fire while the C_4's were not. C_4's retained a greater proportion of biomass belowground and through reallocation were able to re-grow leaf area faster than the C_3's. Differences in growth and allocation may be related to the greater photosynthetic productivity and nitrogen use efficiency of C_4 plants. Drought experiments on *Alloteropsis* and other Panicoid grasses showed differential effects on C_3 and C_4 productivity, removing the C_4 photosynthetic advantage due to greater metabolic limitations of photosynthesis and prolonged recovery on re-watering. This drought response may explain the paradox of declining NADP-ME species numbers with decreased rainfall, despite the apparent water use efficiency advantage of C_4 photosynthesis.

doi:10.1016/j.sajb.2008.01.100

A histological examination of desiccated *Eucalyptus in vitro* axillary buds

I.M. Risenga[a], M.P. Watt[b], N. Edwards[c], D.J. Mycock[a]
[a]*School of Animal, Plant and Environmental Sciences, University of the Witwatersrand, Johannesburg 2050, South Africa*
[b]*School of Biological and Conservation Sciences, University of KwaZulu-Natal, Durban, South Africa*
[c]*Mondi Business Paper, Trahar Technology Centre, Hilton, South Africa*

Eucalypus grandis is the most important and widely planted eucalypt in South Africa. It has a wide range of uses including pulpwood, poles, firewood, charcoal, flooring, mining, furniture and general carpentry. Conservation of plant genetic resources including those used in agriculture, horticulture and forestry has become an issue of common global concern. Cryopreservation involves the storage of plant material at ultra low temperature (−196 °C). The techniques for cryopreservation currently in use are varied and include the older classical techniques and the new vitrification-based techniques. Dessication is commonly used in the preparation of *in vitro* material for cyostorage. During desiccation, the physical and physiological characteristics of the cell change because of the removal of water and damage is reflected by the lack of resumption of normal activity upon rehydration. In a previous study conducted in our laboratories it was concluded that the application of ABA for a preculture period of 5 days resulted in an induction of better tolerance to desiccation compared with the untreated control material. The study is investigating the cause of loss of cell viability in the existing cryopreservation protocol for *E. grandis* and is making use of various forms of microscopy. The present contribution will illustrate the effects of ABA pre-treated and partial desiccation on the tissues of isolated *in* vitro axillary buds of *E. grandis*.

doi:10.1016/j.sajb.2008.01.101

Does autogamy contribute to invasion in *Lilium formosanum*?

J.G. Rodger[a], M. Van Kleunen[b], S.D. Johnson[a]
[a]*School of Biological and Conservation Sciences, University of KwaZulu-Natal Pietermaritzburg, Private Bag X01, Scottsville 3209, South Africa*
[b]*Institute of Plant Sciences, University of Bern, Altenbergrain 21, CH-3013 Bern, Switzerland*

The Taiwanese geophyte *Lilium formosanum* is invasive in the eastern parts of South Africa. Although it is capable of autogamy, a pollinator, the hawkmoth *Agrius convolvuli*, is present. Reproduction may therefore take place both by self- and cross-fertilisation. The relative importance of these modes of pollination for seed production is evaluated using emasculation experiments. The potential contributions of outcrossed and selfed progeny to invasion are assessed in progeny performance trials.

doi:10.1016/j.sajb.2008.01.102

Pollinator-driven floral variation in *Tritoniopsis revoluta*

P. Ros, B.C. Anderson, A. Ellis
Department of Botany and Zoology, University of Stellenbosch, Private Bag X1, Matieland 7602, South Africa

The genus *Tritoniopsis* (Iridaceae) consists of 24 species and is endemic to South Africa. The genus exhibits a high degree of floral variation, and pollination occurs through a wide variety of pollinators (bees, flies, moths, birds). In *Tritoniopsis revoluta*, considerable variation is seen in perianth tube lengths (14–85 mm), which led me to hypothesize that the variation in the tube lengths of *Tritoniopsis revoluta* may be due to different pollinator morphology at different populations. Seven different *Tritoniopsis revoluta* populations with tube lengths spanning the entire length-range were found using herbarium data. From these populations pollinator and tube-length data were collected, and compared. I found that tube length can be divided into 2 discrete categories, namely short (10–45 mm) and long (50–85 mm). In addition to this there is one population with a bimodal distribution in corolla tube length, which suggests that plants with different tube lengths could be incipient species. Flies with proboscis lengths matching the short category have been caught, but no flies have been caught in populations with long tubes. Future research will concentrate on how different morphs are maintained in different populations, and in sympatry. In particular I will undertake a population genetics study to establish whether there is gene flow between different morphs in bimodal populations, and whether there is gene flow between the different populations themselves.

doi:10.1016/j.sajb.2008.01.103

Discovery of new fungi associated with the decline and death of *Euphorbia ingens* in the Limpopo Province of South Africa

J. Roux[a], R. Malan[b], M. Howitt[c], D. Six[d], M.J. Wingfield[a]
[a]*DST/NRF Centre of Excellence in Tree Health Biotechnology, Forestry and Agricultural Biotechnology Institute (FABI), University of Pretoria, Pretoria 0002, South Africa*
[b]*PO Box 689, Mokopane 0600, South Africa*
[c]*National Zoological Gardens Biodiversity Conservation Centre, Mokopane, South Africa*
[d]*Department of Ecosystem and Conservation Science, College of Forestry and Conservation, The University of Montana, Missoula, United States*

Euphorbia ingens (Euphorbiaceae), commonly known as naboom or candelabra trees, are a dominant feature of the Limpopo Province vegetation. In recent years, these trees have been observed to be diseased and dying. A recent survey of *E. ingens* trees at the National Zoological Gardens Biodiversity Conservation Centre at Mokopane revealed that more than 90% of the trees in that area are diseased and dying. The aim of this study was to describe the disease and to consider the possible involvement of fungi and